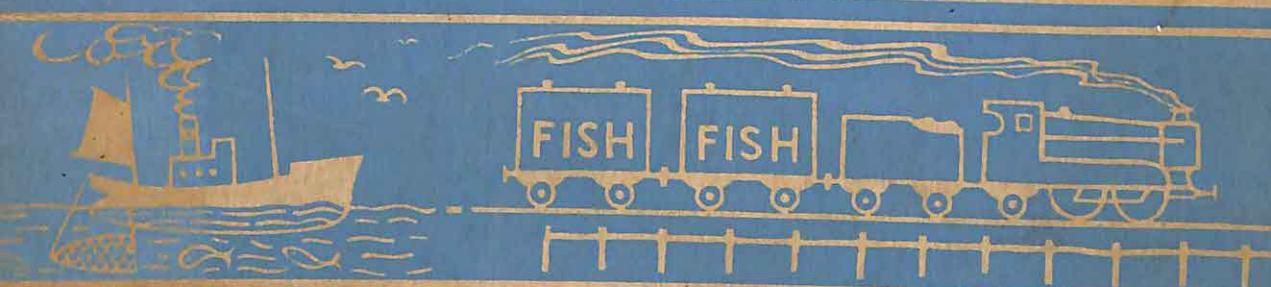
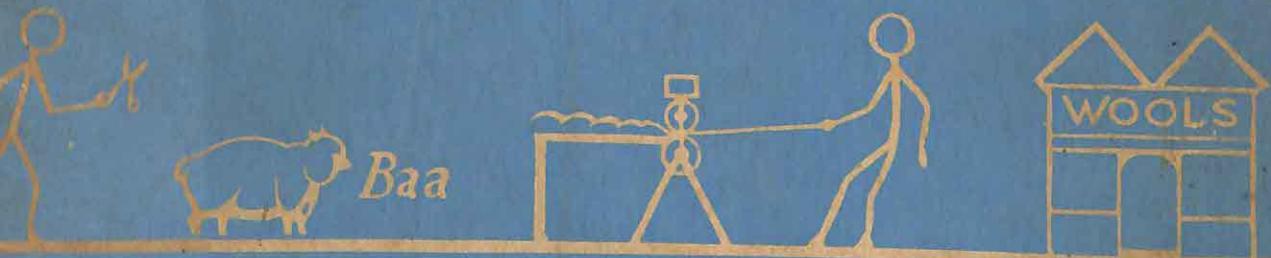


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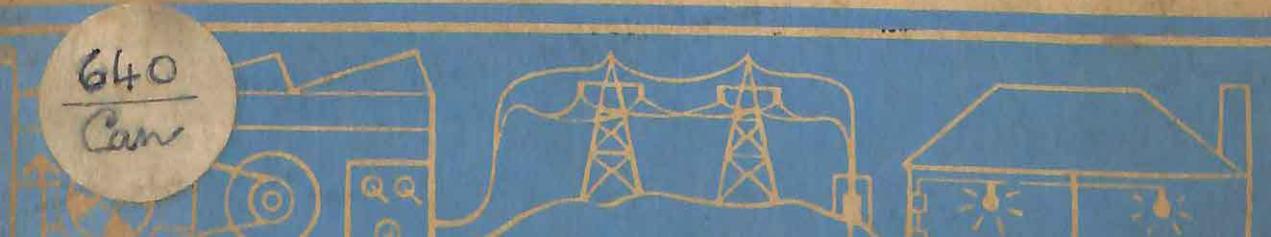
ALL KNOW



BOOK 2

by R. J. CANDY

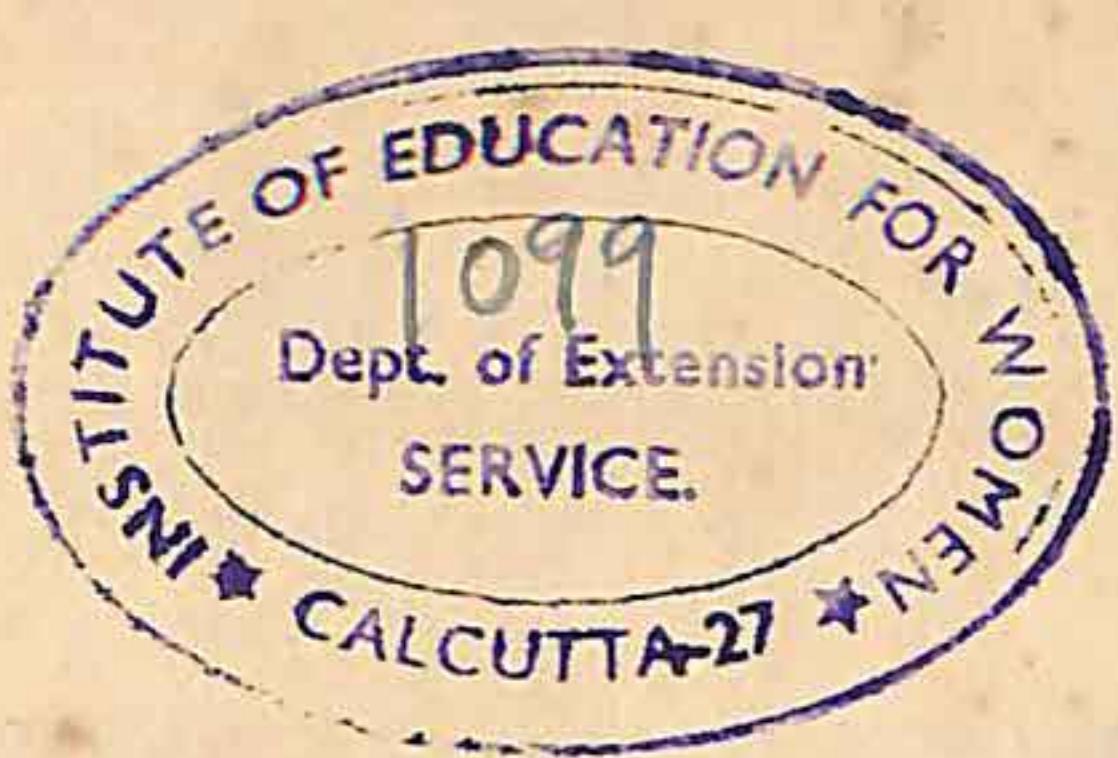
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This map shows you where the different commodities mentioned in the book come from.

The Commonwealth countries are shaded.



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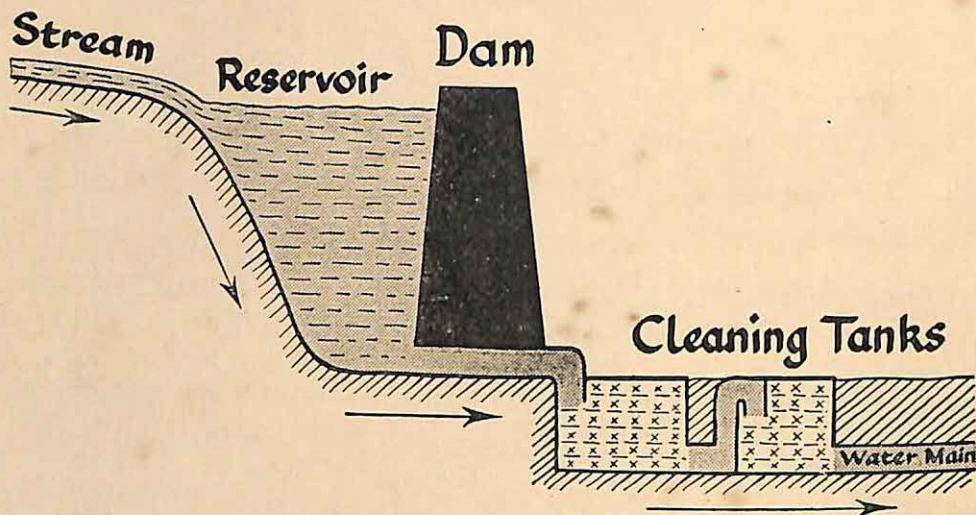
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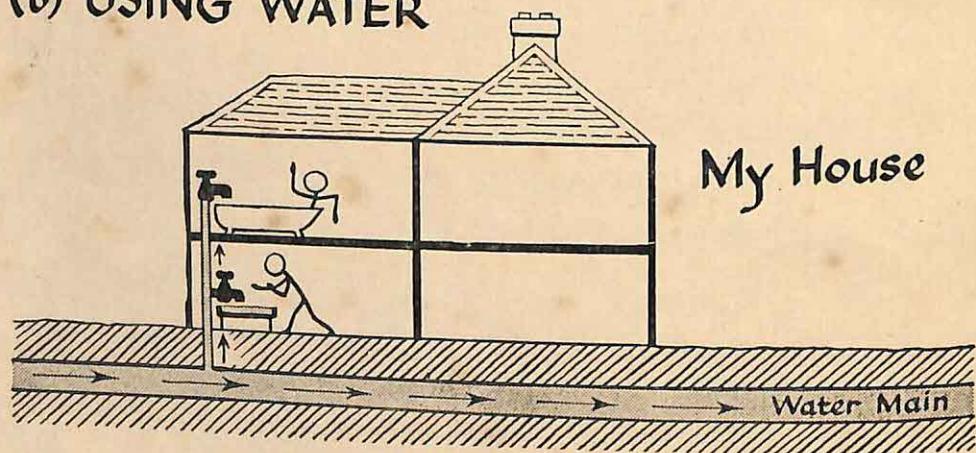
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1. From Dam to Water-tap

(a) GETTING WATER



(b) USING WATER



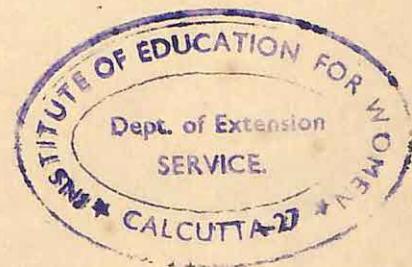
I. FROM DAM TO WATER-TAP

Have you ever wondered where the water comes from when you turn on a tap in your house? Some of you may live near a mountain where the water from a stream or small river can be collected. A thick stone wall is built across the stream to stop it from flowing down to the sea. This wall is called a dam. The water soon collects behind it in the reservoir, as it is called. The water has to be cleaned before it is used, and it is therefore made to trickle through long flat tanks filled with layers of sand, gravel and small stones. Any dirt in the water stays on top of the sand. Usually a little disinfectant is put in the water to kill any germs that may be there.

From the cleaning tanks, pipes called the water mains come to your house. Some of the largest pipes are big enough for a man to walk through. A small pipe joins all the taps in your house to the water main. Sometimes in hot weather the water in the reservoir will get very low, as there has been little rain to fill it up again. Then the water company will have to ask your parents to be careful not to waste water in case there is not enough for everyone.

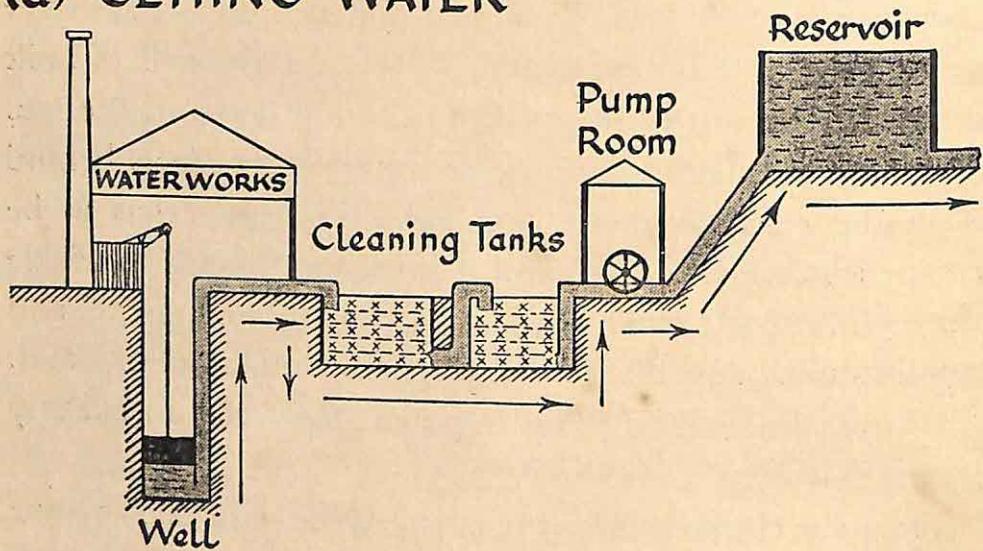
Collect pictures of a dam ; a reservoir ; taps ; sinks ; baths.

Make a list of the names of some famous dams.

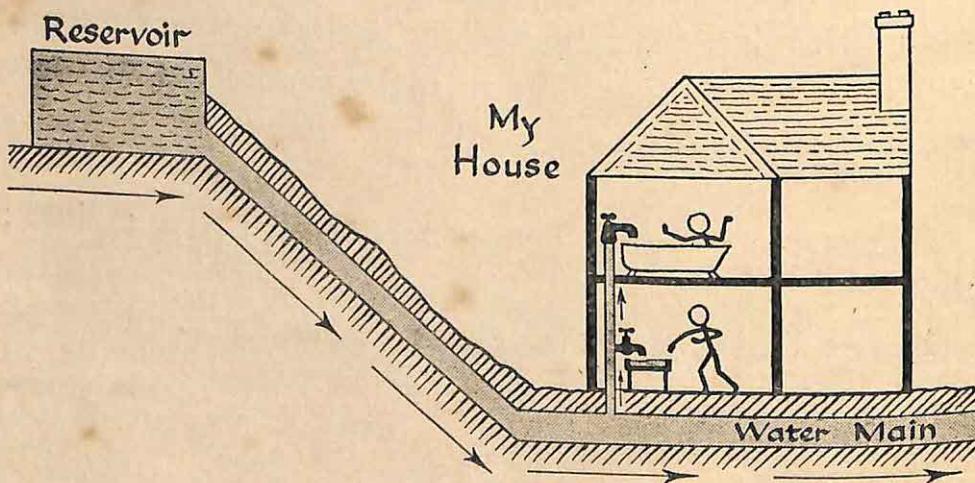


2. From Well to Water-tap

(a) GETTING WATER



(b) USING WATER



2. FROM WELL TO WATER-TAP

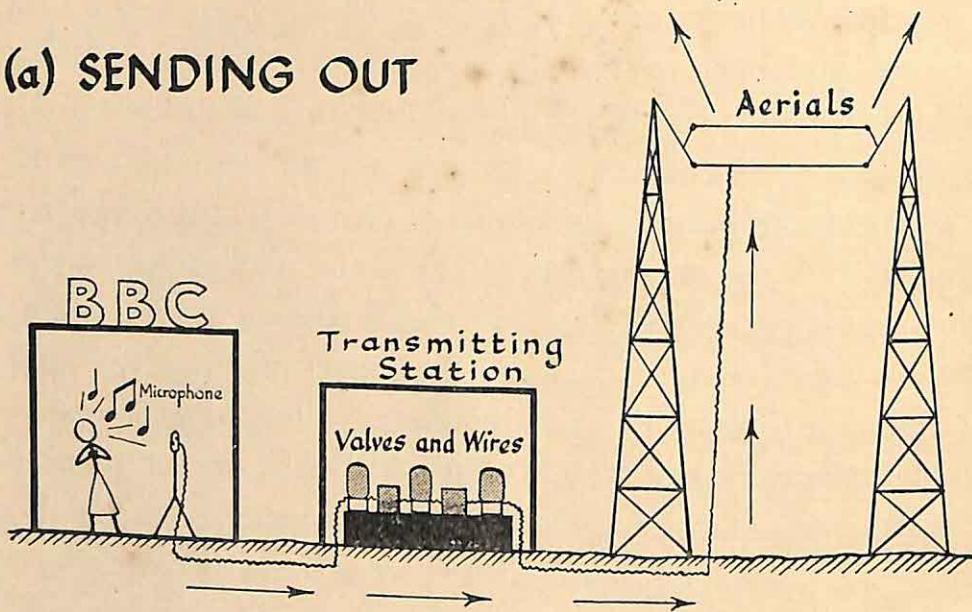
Some of you will not live near enough to a mountain for your drinking water to be collected by a dam being built across a stream, so instead it will come from a well. A deep hole is dug into the earth, from which the water has to be pumped out. A building is put up over the well for the pump, and the steam engine or electric motor that drives it. This is the waterworks. The water has to go through the same sort of cleaning tank filled with sand, gravel and stones as we read about in Chapter 1, and has the same disinfectant put in to kill any germs. This time there is no dam to make a reservoir, and a huge brick or stone tank is built on top of a hill. The water is pumped up into it.

If you live in a small village, your reservoir may be a large iron or concrete tank built on legs like a table, like those you often see beside a railway line. The reservoir is always higher than any tap so that the water may run down-hill through the pipes to the tap. In small villages where there are no waterworks all water has to come from small wells. This means pulling up every bucketful yourself. How much easier if you can just turn on a tap ?

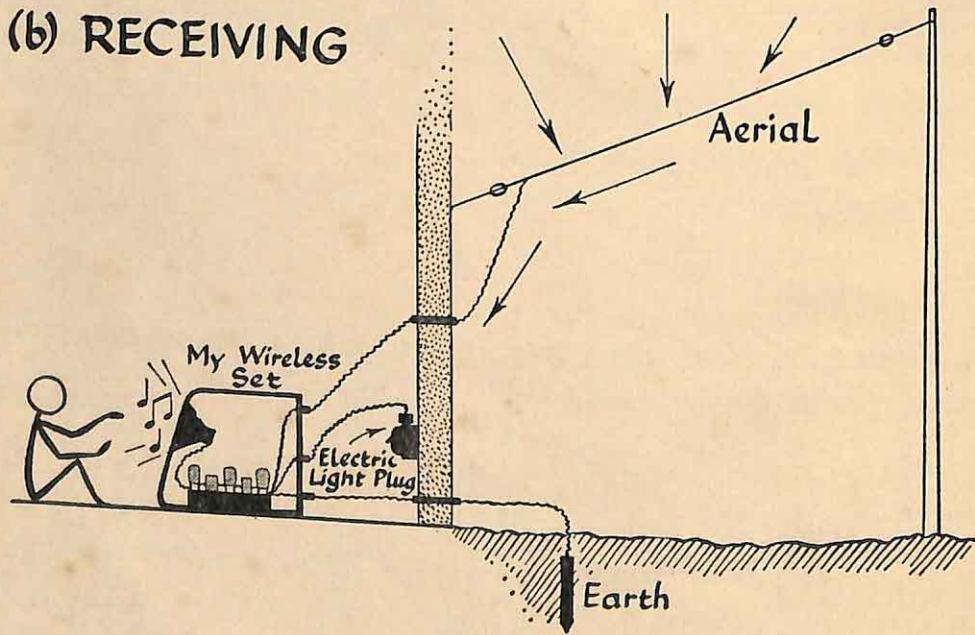
Collect pictures of waterworks ; wells ; water tanks on legs.

3. From B. B. C. to Loudspeaker

(a) SENDING OUT



(b) RECEIVING



3. FROM B.B.C. TO LOUDSPEAKER

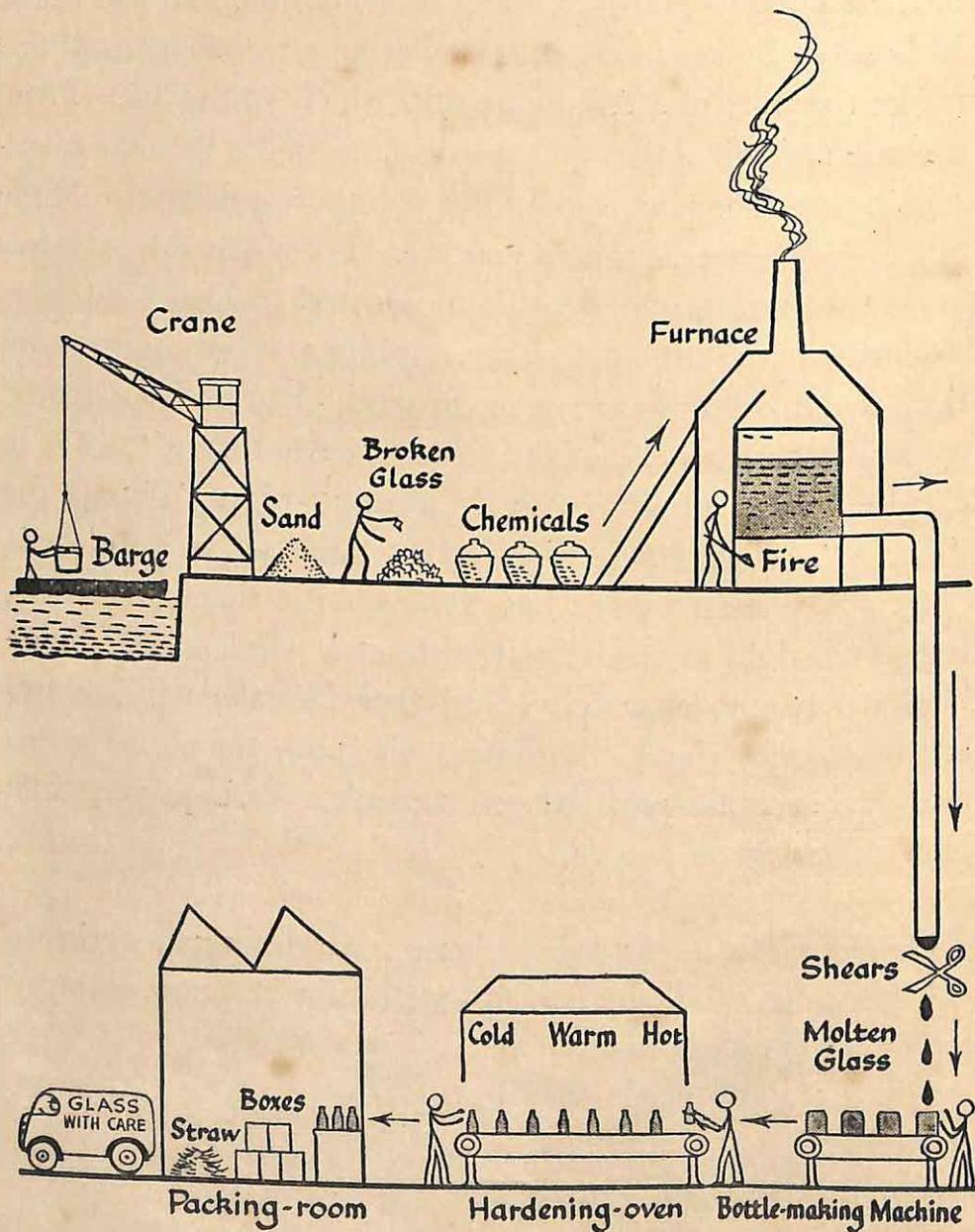
Let us find out what is on the wireless. A man is singing in the Light Programme, so let us switch on. In the studio in London he is singing into a microphone. A microphone is like the part of a telephone into which you speak. From it come two wires that go underground to the wireless transmitting station, which looks like a huge wireless set. Some of the valves are as tall as you are. From the valves, wires go to the aerials, which are hung on steel towers.

Through the air come the invisible wireless waves until they reach the aerial in your garden. The aerial is joined by a wire to the back of the wireless. Another wire goes to a tube buried in the earth or a water pipe. This is the "earth". Two more wires connect the set to an electric plug. The man's voice has come silently through the air, but you would never hear it without a wireless set. Some houses have no electricity, and therefore the wireless sets are worked by electric batteries. So, also, are portable sets that you can take with you on a picnic. Perhaps you have seen a wireless set in a car.

Collect pictures of a microphone ; wireless sets ; aerials.

Make a list of all the British wireless stations and as many foreign ones as you know.

4. From Sand to Milk-bottle



4. FROM SAND TO MILK-BOTTLE

A heap of yellow sand does not look like a milk bottle, and yet it is easily turned into one at a glass-works. The sand is usually carried to the glass-works by barge and taken out by a crane. The sand is mixed with broken glass and chemicals and shovelled into a huge furnace where it is melted down into glass.

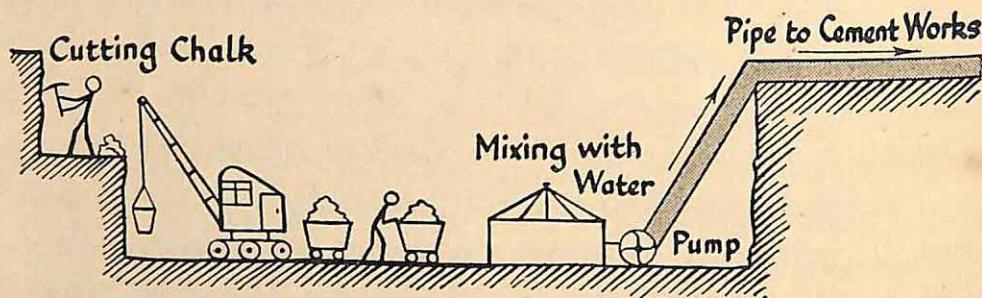
From the furnace the glass flows along a channel above each bottle-making machine. It drops through a small hole under which a pair of shears cut off enough glass to make a bottle. The glass is soft enough to be shaped like plasticine, and falls into a mould which looks like a bottle upside down. Hot air is blown in to shape the inside. By the time the glass leaves the machine it has been made into a bottle.

The red-hot glass must be hardened in an oven so that it does not break when it cools down. The floor of this oven slowly moves through, taking the bottles with it. The oven is very hot at the beginning, but not hot enough to melt the glass. The bottles take about three hours to pass through, and as they do so, the temperature of the oven gets gradually cooler, so that they are cold by the time they come out. All that remains is to pick out any damaged ones and pack the rest in boxes to send to the dairy.

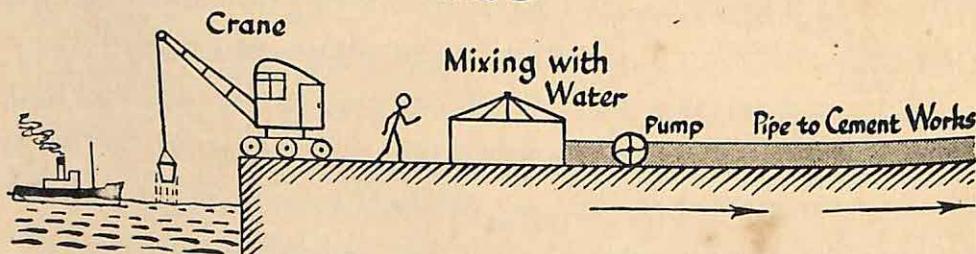
Make a list of the things that are made of glass.

5. From Chalk Pit to Cement

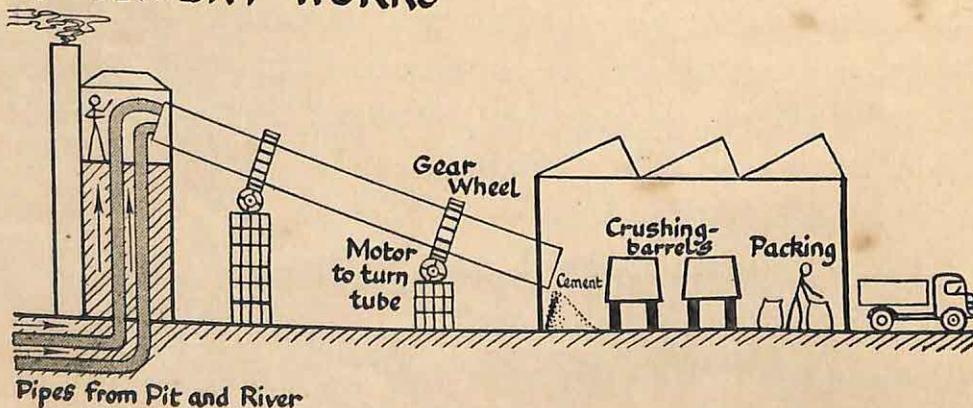
(a) THE CHALK PIT



(b) GETTING RIVER MUD



(c) CEMENT WORKS



5. FROM CHALK PIT TO CEMENT

If anything is being built near you, the builder is bound to be using cement. You may have seen chalk being dug out of the earth for this. It is crushed up, the flints are taken out, and then it is mixed with water by a large paddle wheel in a tank. It can then be pumped along pipes to the cement works. Clay is also wanted, and this may come from the bed of a river. It is pumped in the same way to the works.

There, the two watery mixtures are put into the top end of a long sloping iron tube that is kept revolving. Up the tube to meet the mixture comes a long gas flame that quickly boils the water away as steam and turns the chalk and clay into lumps of cement looking like large cinders. These fall out of the bottom of the tube, and are then put into revolving barrels full of steel balls to be crushed into powder. Each barrel contains smaller balls than the one before, and the cement is crushed finer and finer.

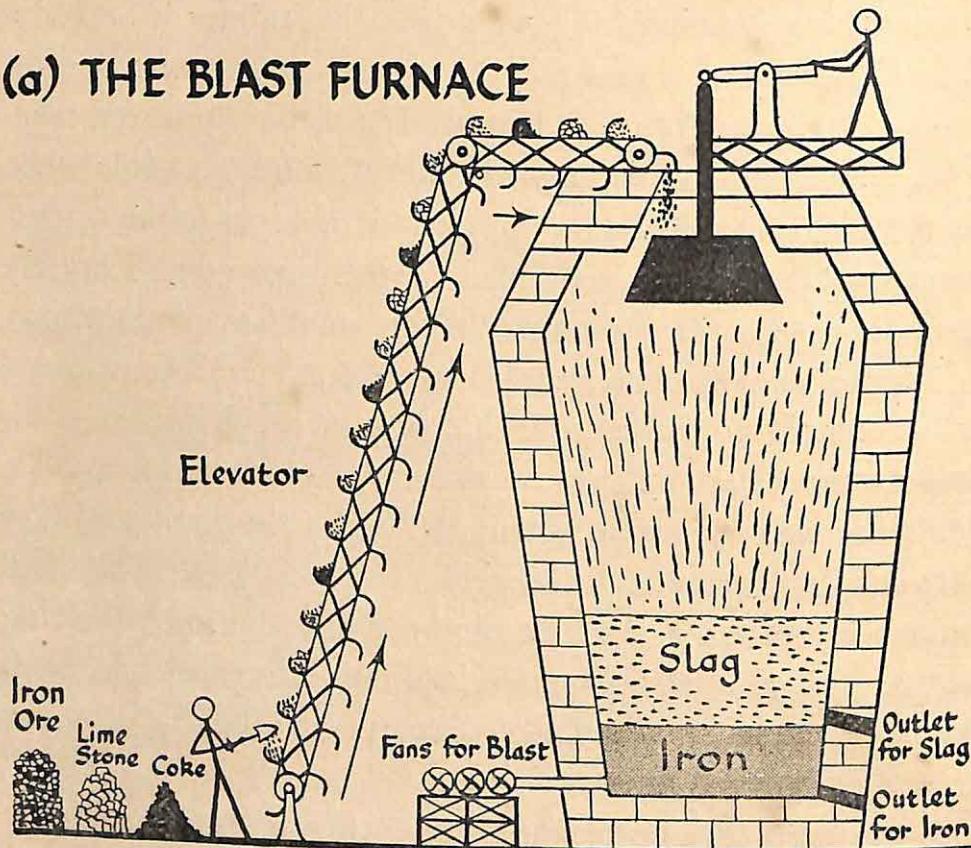
It is stored in a huge container until it is put into double paper-bags, one inside the other for strength. A hand machine ties the mouth of the bag with wire, to prevent damp from getting in.

Collect advertisements of the Cement Companies.

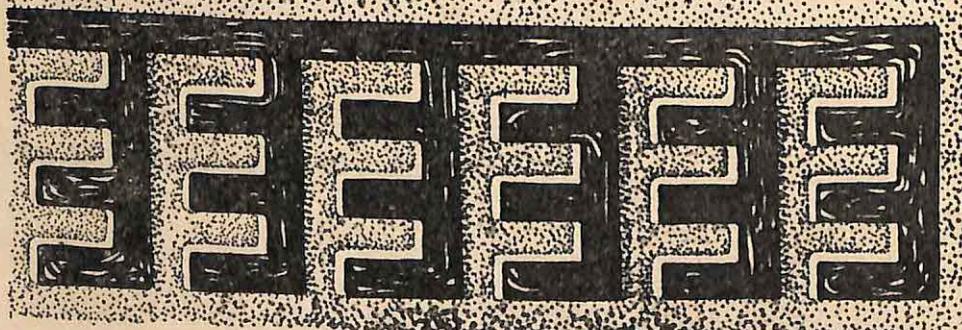
Make a list of all the ways in which a builder uses cement in building a house.

6. From Mine to Poker

(a) THE BLAST FURNACE



(b) PIG IRON



6. FROM MINE TO POKER

You will find many things in your home made from iron. To make a poker, the reddish-brown rock called iron ore must be dug out of the ground. This may be done in a quarry or else in a deep mine. Limestone, a rock like hard chalk, will be dug out too. The third thing wanted, as a fuel to melt the iron, is coke from the gasworks.

These three things are taken to the ironworks and are put into a blast furnace. This is a steel tube lined with thick fire bricks. The coke burns, and a blast of air blown in at the bottom makes it hot enough to melt the iron. The molten iron sinks to the bottom while the rocky waste mixes with the limestone and floats on top. This is called the slag. From time to time a clay stopper is knocked out and the molten iron runs out across the floor in sand channels made for it, where it cools down and is broken into pieces called pig iron.

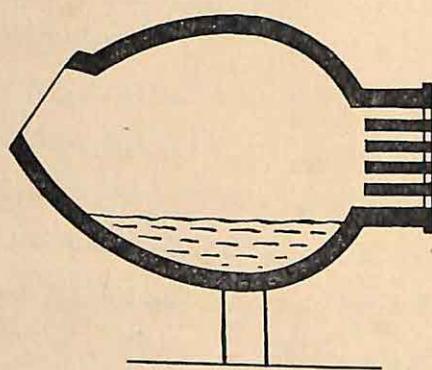
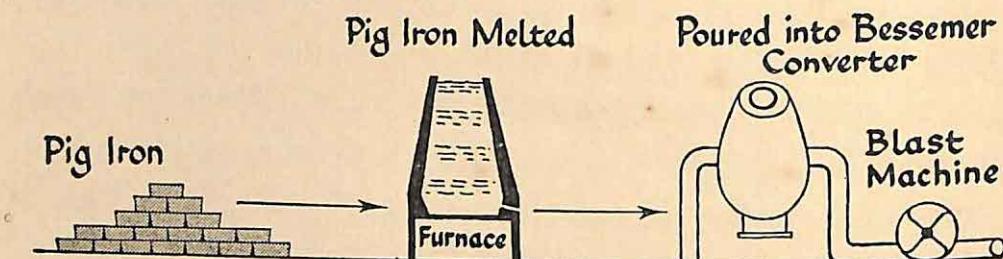
From pig iron articles such as a poker are made. The slag also is taken out and can often be seen in heaps near the ironworks. As the furnace is emptied, so more materials are put in at the top. When this is done huge flames shoot out, and these light up the countryside.

Collect pictures of an ironworks ; a blast furnace.

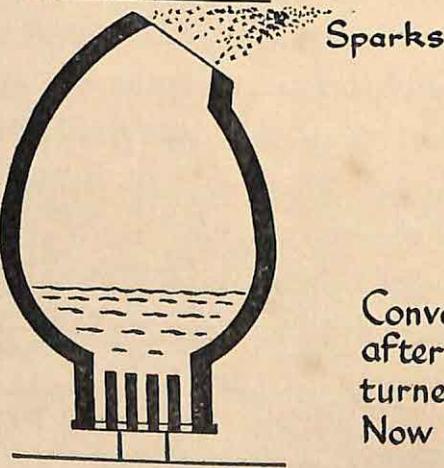
Make a list of things made of iron.



7. From Pig Iron to Penknife



Converter swung down
to fill with Pig Iron or
to empty finished Steel



Converter swung up
after blast has been
turned on
Now making Steel

7. FROM PIG IRON TO PENKNIFE

Although iron is a very useful metal for some things, it is too soft and brittle to be used for articles which must be knocked like a hammer-head or sharpened like a penknife. For these the iron must be turned into steel. To do this, any other things still mixed with the iron must be burnt out.

One way to do this is in a Bessemer Converter. This looks very like one kind of cement-mixer, and although the drum does not turn round and round, it can be tilted up and down so that it can be filled and emptied. Pig iron is melted down and poured into the converter. A blast of cold air is turned on and is blown through holes in the bottom. The converter is then tilted upright so that the air blows through the iron and burns out impurities in a shower of sparks. The converter is then tilted down again.

Small amounts of other metals such as chromium and nickel are then melted in the steel, to make it harder if it is to be used for gear wheels, or brighter if it is for stainless steel penknives. The steel is now poured out of the converter and taken away to be used to make many articles. Perhaps it will be poured into a mould of sand, or perhaps it will be rolled out by rollers, as when railway lines are made.

Make a list of things made from steel.

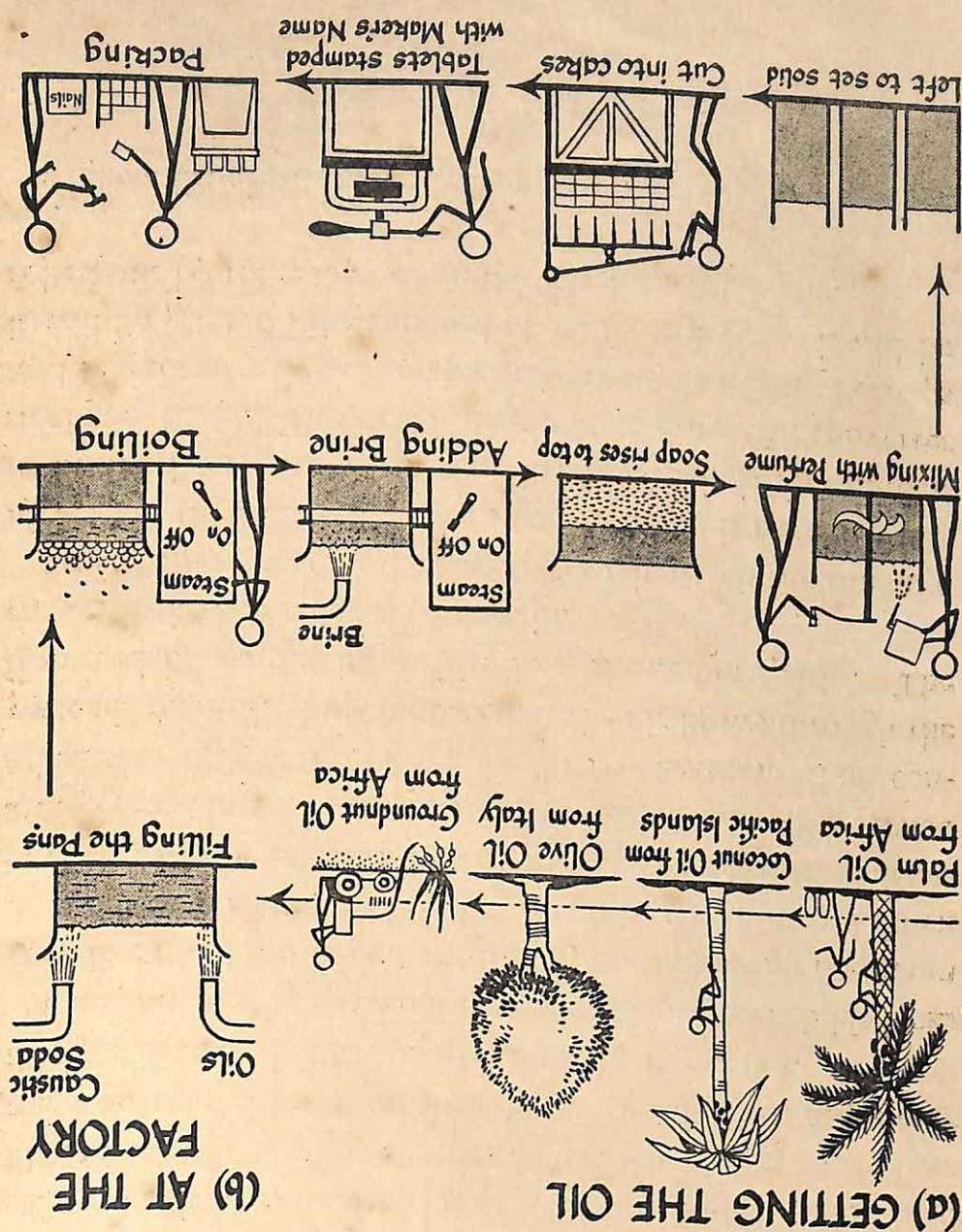
Various oils are needed to make soap. Among these are palm oil from the nuts of palm trees, coconut oil from coco-nuts, olive oil from the fruit of the olive tree, and ground nut oil from the nuts we usually call peanuts. These nuts are cracked open, and the oil is crushed out and sent in barrels or tankers ships to the soap factories. Here the oils are mixed and poured into large pans. The chemical called caustic soda is dissolved in water. This lye, as it is called, is poured in. These pans have steam pipes inside them to boil the mixture when the steam is turned on.

Later, brine is poured in and the mixture starts to thicken. The steam is now turned off, and the soap then rises to the top and the liquid called the spent lye falls to the bottom. It contains glycerine which is taken out to be purified. After five or six days the soap curd is taken out into mixing machines where perfume and colour may be put in.

It is then left in steel containers to set into a block. Each block weighs about 15 cwt., so the soap is next cut into bars with the maker's name, wrapped and packed into boxes, by wires. From these, tablets are made and are stamped ready to be sold.

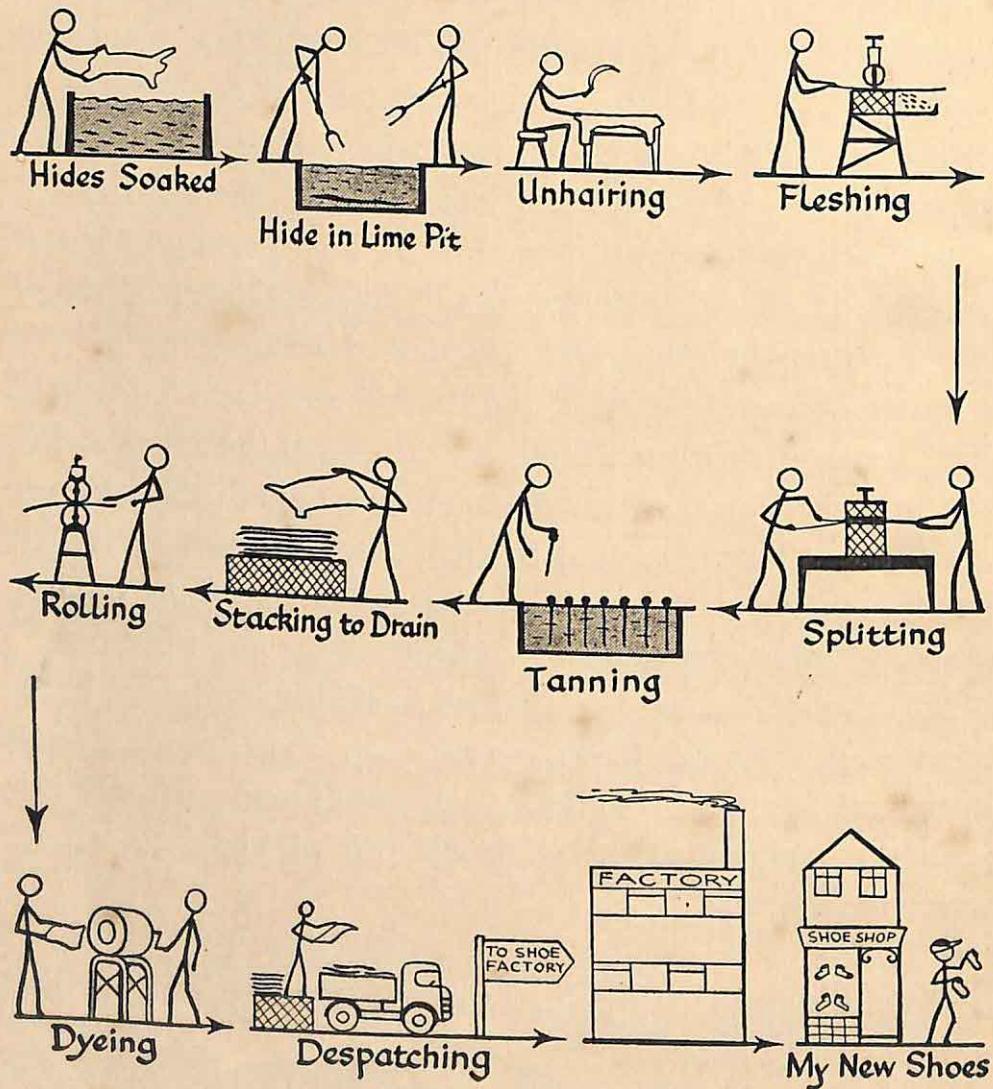
Collect pictures of palm trees; coconut palms; olive trees; ground nuts.

Collect wrappes from cakes of soap.



8. From Palm Tree to Cake of Soap

9. From Cow to Pair of Shoes



9. FROM COW TO PAIR OF SHOES

The shoes that you are wearing were once walking around, on the back of a cow.

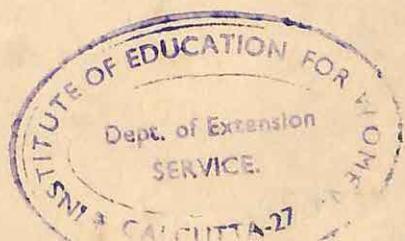
When cattle are killed for meat, the hides are saved and rubbed with salt to stop them from going bad on their journey to the tannery, as the leather-making factory is called.

Here the hides are soaked to soften them and remove any dirt, and are then put in pits full of lime to loosen the hairs. These are scraped off by machine or by hand, using a curved blunt knife. A fleshing machine now takes off any unwanted material from the underside of the hide. Some hides will be too thick and these are quickly split into two layers as easily as being put through a mangle. Each hide is now fastened to a rod and hung in the tanning pit, where it remains for several weeks. The liquid in this may be made from the bark of the oak or other trees or from chemicals. After some time the hides are stacked to drain off. Before they are completely dry they are rolled, to help them stand up to hard wear.

Hides may need to be dyed and have a pattern stamped on them if they are to be used for the uppers of shoes. They are then sent to the shoe factory, where more machines turn them into boots and shoes.

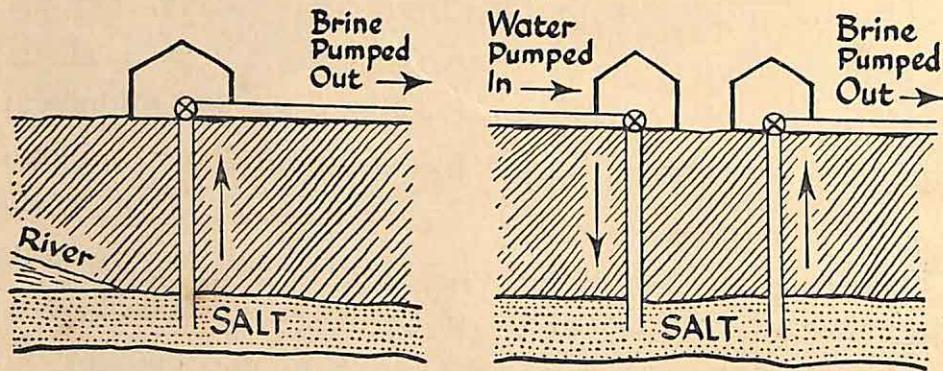
Collect pictures of a tannery and a shoe factory.

Make a list of things made from leather.

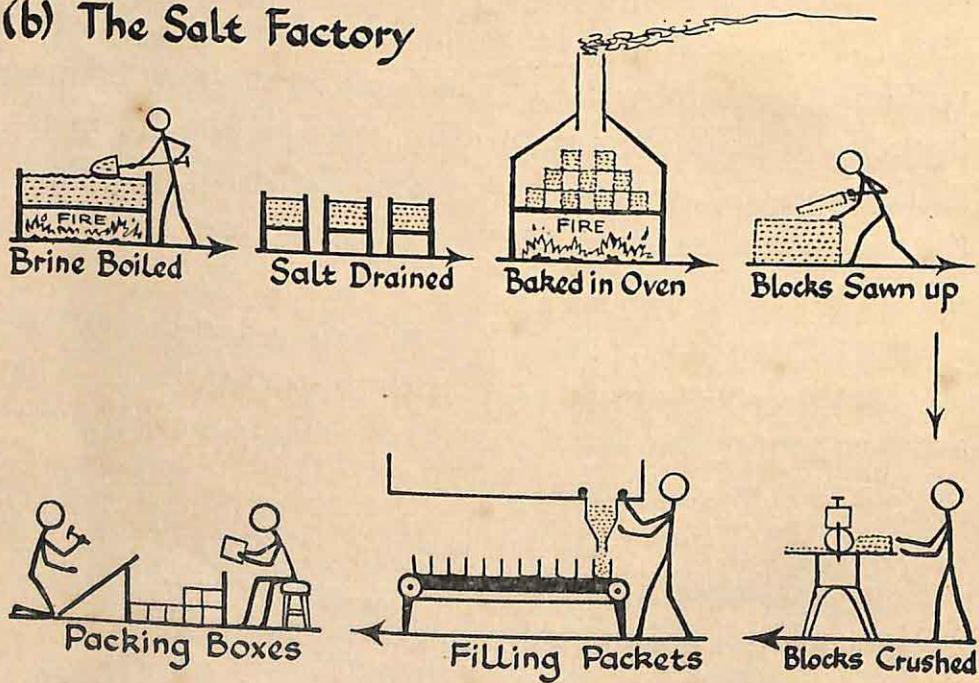


10. From Mine to Salt-cellars

(a) Getting Brine from Underground



(b) The Salt Factory



10. FROM MINE TO SALT-CELLAR

At many places under the earth are huge beds of salt, left behind by the seas that once covered those parts of the land. Underground rivers may have found their way to the salt and dissolved it once more. The brine can then be pumped up like water from a well and the salt taken out for use on your table.

If the salt is there as a pink rock, either it is dug out like coal or, as happens in many parts of England, a large pipe is built down to the salt. Water is then pumped down to dissolve it, and the brine formed is pumped up another pipe.

The brine is put into steel pans which are heated with fires. The water is boiled off as steam and the salt left in the pans. From time to time men go to the pans with shovels drilled with many holes and scoop out the salt. The wet salt is put into wooden boxes with holes in the bottom. Most of the brine left drains off, and then the salt is baked in a huge block to dry it out completely. Some blocks are sawn up into smaller ones, which are wrapped and sold. Others are crushed up, sifted and put into packets. The packets are wrapped in cellophane to keep the salt dry until it is sold.

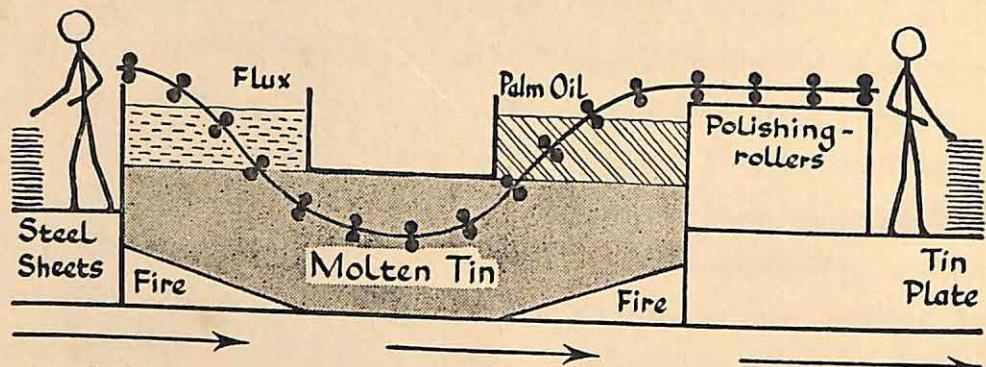
Collect labels from salt packets.

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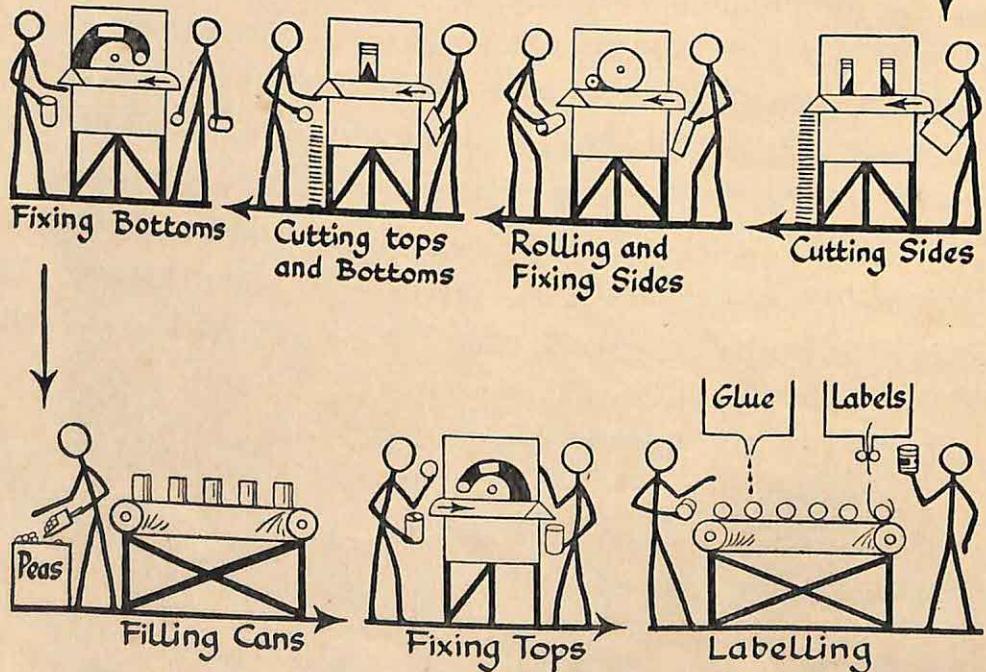
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Can

II. From Mine to Tin Can

(a) MAKING TIN PLATE



(b) MAKING A TIN CAN



II. FROM MINE TO TIN CAN

Any tin can that you see is really made of thin iron with a coating of the metal tin on both sides to prevent rust. Tin is found under the earth as tin ore. After being washed this rock has to be roasted with charcoal in a furnace called a smelter. The tin melts and collects in a hollow at the bottom. It is then poured into special moulds and left to cool. This whole process is known as smelting.

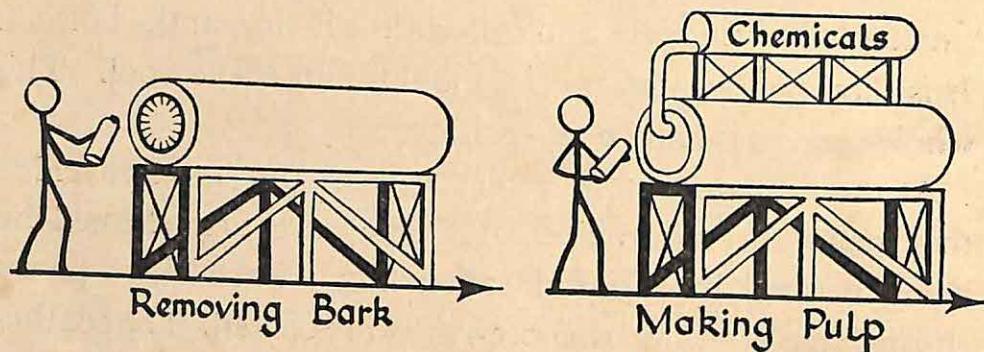
At the tinplate factory, steel sheets are put into a machine that turns them into tinplate. They are first cleaned by being washed in a liquid called flux. Each sheet passes through molten tin so that both sides are coated. The coating is cooled in palm oil and then special rollers clean and polish it.

The sheets are then ready to be made into tin cans by a series of machines. One cuts circular pieces for the tops and bottom. Another cuts pieces the right size for the sides. The next curves and fixes them into the round shape. Another bends the top and bottom edges ready for the two circular pieces. The bottom is fitted, the can filled and the top sealed on. The can then passes through a final machine which smears a label with glue and rolls it on. Most tin cans are now packed in cardboard boxes to save weight.

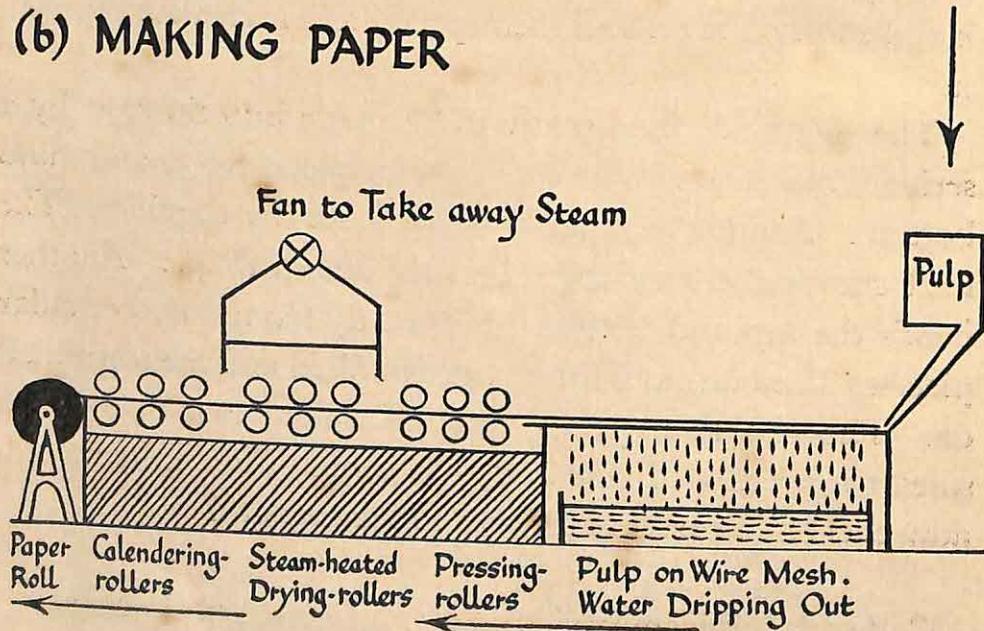
Collect labels from various sizes and shapes of tin cans.

12. From Tree to Daily Paper

(a) MAKING WOOD PULP



(b) MAKING PAPER



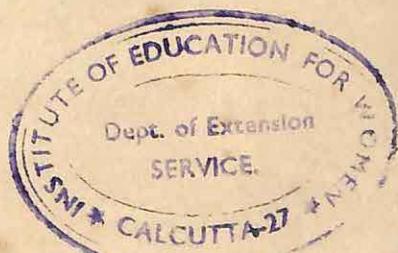
12. FROM TREE TO DAILY PAPER

No matter which daily paper you have in your home, the paper for it will have been made from wood in a paper mill. Many thousands of tons of soft wood come to this country as short logs about four feet long. They are placed in a revolving drum with spikes on the inside, and these tear off the bark which would be useless for paper-making.

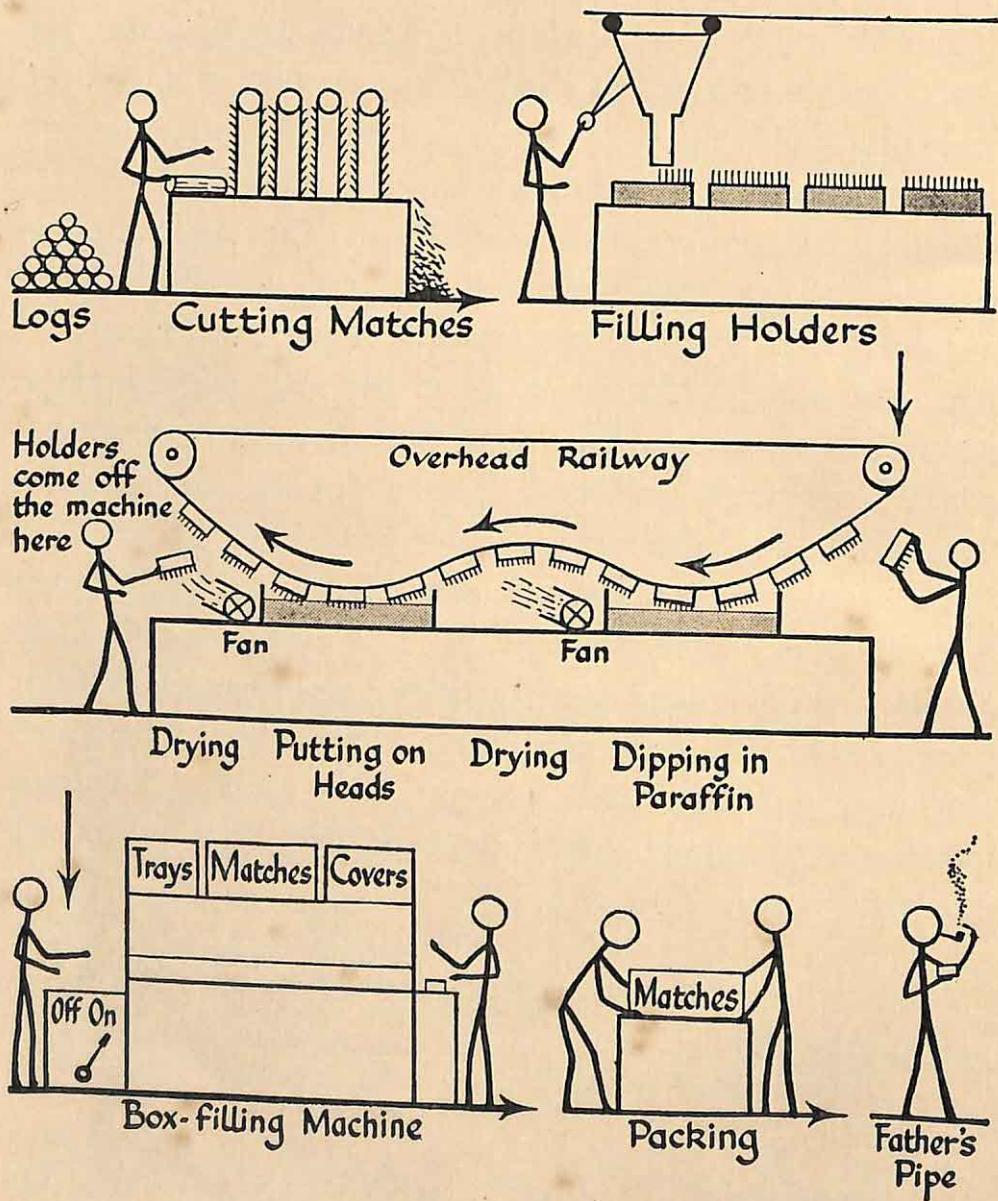
The logs are then crushed up with water in a machine, just as though they are being chewed. The pulp that is produced is mixed with chemicals to break it down even more and bleach it white. It then passes to the long paper-making machine. In this the pulp is spread evenly on a wire mesh which is constantly shaken as it passes through the machine. This gradually shakes out the water.

The wet paper is pressed between rollers and dried between heated rollers. The steam is taken away by electric fans. Finally, special rollers called calendering rollers smooth the paper and give it a good surface. The paper leaves them and is wound into huge rolls containing over a mile. They are sent to the newspaper offices to be printed, cut, and folded into daily papers.

Collect the printed names from daily, Sunday, and weekly newspapers.



13. From Tree to Match-box



13. FROM TREE TO MATCH-BOX

There are two kinds of matches. The first are usually called Vesta matches and have in the head all the chemicals which will give a flame when rubbed. These will strike anywhere. The second, called safety matches, have half the chemicals in the head and the other half on the side of the box. These can only be struck on the box.

To make safety matches, wood is cut up by a machine to the exact size of matches. Bundles of these are gripped in a holder, and the heated ends are dipped in paraffin wax so that the wood will burn easily. Chemicals have been melted in pans and the sticks are dipped in these to make the head. They are dried by blasts of cold dry air.

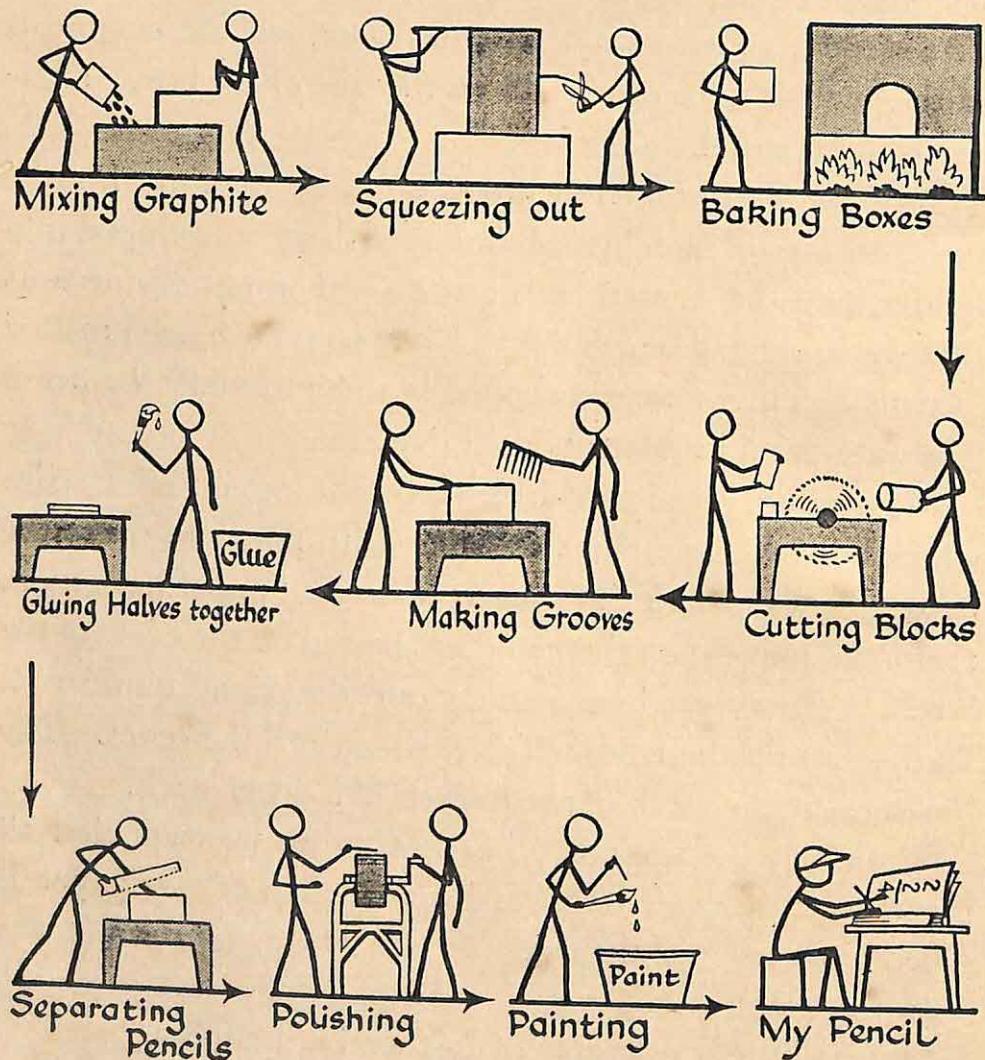
Meanwhile, other machines have split logs into thin strips which are bent and stuck together with paper to make the two parts of the box. Two narrow strips of paper have more chemicals painted on them and are pasted on the edges of the box. A final machine counts out the right number of matches to fill the tray, which it slides into the cover. The boxes are wrapped in paper packets of a dozen each.

Vesta matches are made in the same way except that all the chemicals are in the head and a strip of sandpaper is glued to the edge of the box.

Make a list of the countries that send us matches.

Collect match-box labels.

14. From Mine to Pencil



14. FROM MINE TO PENCIL

Black pencils are usually called lead pencils but they really do not contain lead. The part that writes is made from graphite, which is like coal and is mined in a similar way in Ceylon or Madagascar.

In the pencil factory the graphite is ground to a fine powder with clay. The amount of clay used depends on the type of pencil, which you will tell by such letters as H, HB, BB stamped on it. Water is added, and the mixture is squeezed like toothpaste through a hole, and into a long rod. Pieces of the right length are cut off and put into a clay box with a lid, and are then baked in an oven until hard.

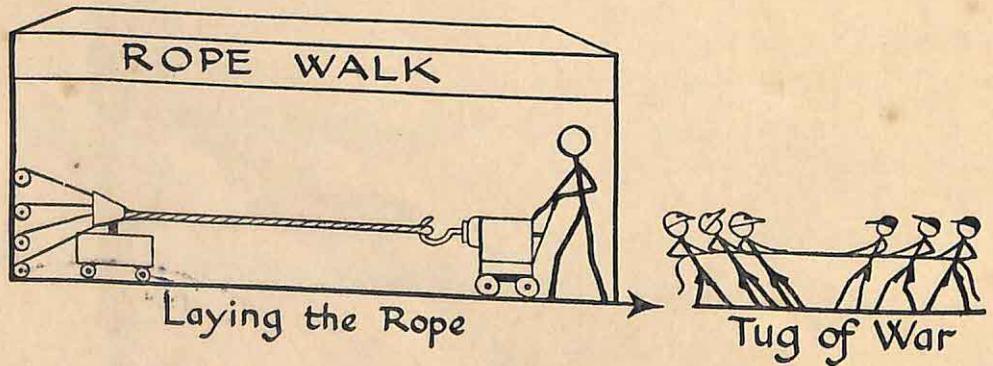
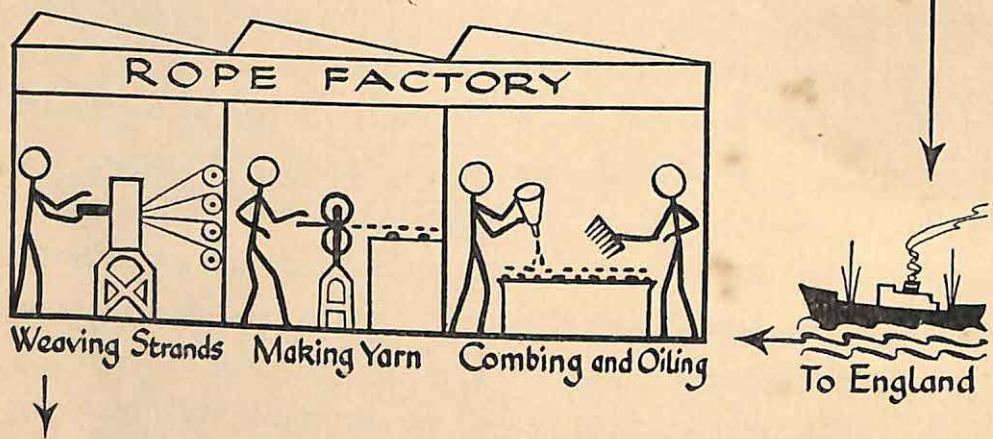
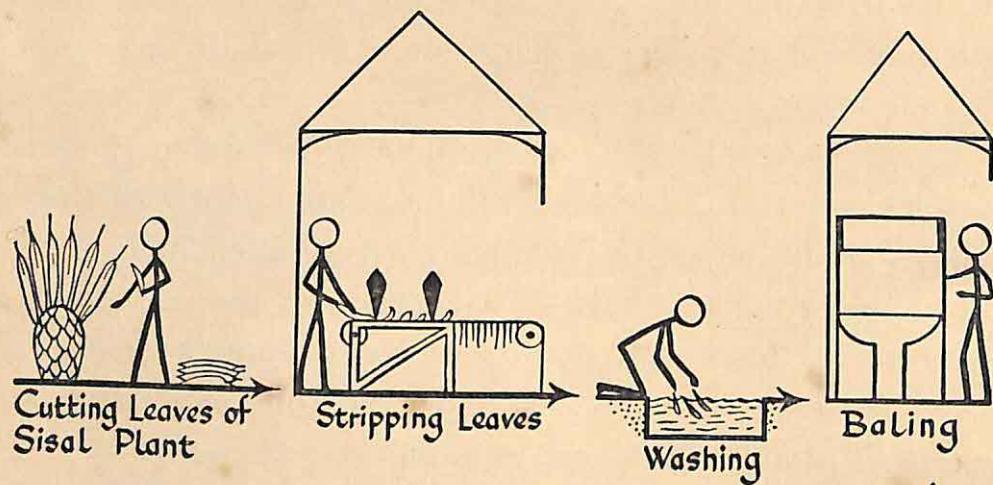
Wood for the pencil will probably have come from one of the kinds of juniper grown in N. America. It is cut into blocks wide enough for six pencils but only half as thick. A machine cuts grooves for six leads, which are put in. A similar block is glued to the top. When the glue is dry a machine separates the six pencils and makes each one round. The next machine polishes the wood so that the pencils may be dipped in the special shiny paint. They still have rough ends, which are smoothed before the stamping machine puts the lettering on them.

All that remains now is to tie them into bundles of one dozen, which are put into boxes or paper wrappers.

Find the names of as many pencil companies as you can.

How many different types of pencil can you find?

15. From Plantation to Rope



15. FROM PLANTATION TO ROPE

Ropes can be seen in use all over the world and the material used for making them was once growing on a plant. Many ropes are made from sisal hemp grown in East Africa. The sisal plant has a short stem rather like a large pineapple, from the top of which grow thick leaves, each with a sharp thorn. Leaves are cut regularly from the plant after the first three years. In the factory the leaves are put into a machine where two knives strip off the flesh and leave the fibres. These are washed and dried in the sun. The dry fibres are brushed by machine so that dust and very short pieces of fibre are beaten away. The long fibres are then put into bales and sent to England.

Here the bales are opened and the fibres combed and lightly oiled, making a long soft untwisted rope called a sliver. Perhaps several slivers of different fibres are mixed before the finished rope is made. The slivers are spun into yarn and several yarns are twisted into a strand. Several strands are closed or laid, as it is called, into the rope. This is done in a very long building called a rope walk. The end of the finished rope is held by a hook, and a travelling machine, twisting the strands, moves backwards as the rope is made. Many ropes have one coloured strand to prevent ropes belonging to one owner from becoming mixed with any others.

Find out why the long building is called a rope walk.



16. QUESTIONS

Here are some questions you can answer. All the answers can be found in the pictures.

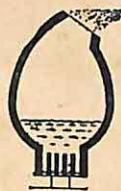
1. What are these?



(a)



(b)

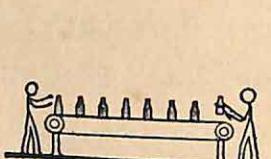


(c)

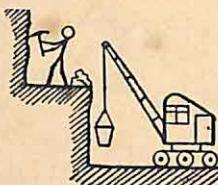


(d)

2. What are these men doing?



(a)



(b)



(c)



(d)



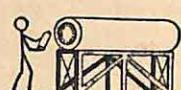
(e)



(f)



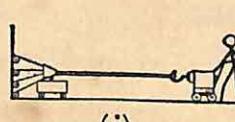
(g)



(h)



(i)



(j)

3. To what three things is a wireless set connected?

1. (a) Dam. (b) Pig iron. (c) Bessemer Converter.
 Here are the answers. How many did you get right?
- (d) Sisal Plant. 2. (a) Making bottles. (b) Cutting Chalk.
 (c) Getting ground nuts. (d) Mixing perfume with soap.
 (e) Soaking hides. (f) Boiling brine. (g) Making tin cans.
 (h) Removing bark. (i) Tipping matches. (j) Laying rope.
3. Arial, earth and electric plug.

THINGS WE ALL KNOW

by

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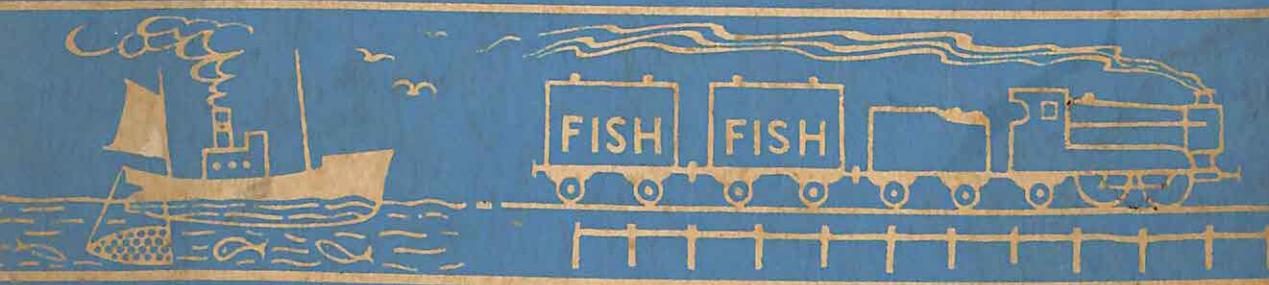
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